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New Frontiers in Multifunctional Material Science and Processing

Serbian Ceramic Society
Institute of Chemistry Technology and Metallurgy
Institute for Technology of Nuclear and Other Raw Mineral Materials
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The influence of mechanical activation on the electrical properties of $Ba_{0.77}Sr_{0.23}TiO_3$ ceramics

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Ferroelectric ceramic barium strontium titanate ($Ba_{0.77}Sr_{0.23}TiO_3$), BST, was prepared by solid-state reactions using starting powders of barium carbonate ($BaCO_3$), strontium carbonate ($SrCO_3$) and titanium dioxide (TiO_2-anatase). Non-activated and mechanically activated mixtures with high-energy planetary ball mill (0, 5, 10, 20, 80 and 120 minutes) were sintered at 1100, 1200, 1300 and 1400 °C for two hours in air. The maximum value of ceramic density is about 86.20% TG. X-ray diffraction analysis was used to obtain information on the phase composition, as well as determining the influence of mechanical activation on the half height width of the diffraction lines (111) BST isothermally sintered samples at 1400 °C during two hours. Defects and the beginning process of sintering on the microstructure were investigated by scanning electron microscopy (SEM). Electrical measurements (loss tangent of the angle, Nyquist diagrams and influence the activation time dependence of $X_C = f(\log \nu)$) are made of ceramics sintered at 1400 °C for two hours.

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Density and electrical properties of cordierite based ceramics as function of compaction pressure

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Mechanical activation is widely used and relatively inexpensive procedure for sintering process sample preparation. However, the influence of pressure, which is used for compaction, has not been completely investigated. Cordierite, $2MgO{\cdot}2Al_2O_3{\cdot}5SiO_2$, is a very actual high-temperature ceramic material, due to its characteristics. Based on our previous investigation, the mechanical activation of the starting mixtures with 5.00 mass% TiO_2 was performed in a high energy ball mill during 10 minutes. Compaction pressure varied from 0.5 to 6t/cm^2 (49 MPa - 588 MPa). Sintering process was performed at 1350^{o}C for 4h in air atmosphere. The phase composition of activated and sintered samples was analyzed by the X-ray diffraction method. Scanning electron microscopy was performed to analyze the microstructure of both compacted and sintered sample. Non-isothermal sintering up to 1400^{o}C, with a constant heating rate, was investigated by thermal shrinkage change with dilatometer. In this paper we research green bodies and sintered samples compaction pressure influence electrical properties.